Discrepancies between demand and supply and adjustment processes on the labour market

Discrepancies between Demand and Supply and Adjustment Processes on the Labour Market

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ROA-RM-1995/4E

This study is part of the research programme of the ROA information system on education and the labour market, subsidized by the Ministry of Education, Culture and Science, the National Career Guidance Information Centre (LDC) and the Central Employment Board (CBA).

Research Centre for Education and the Labour Market

Faculty of Economics and Business Administration
University of Limburg

Maastricht, July 1995

CIP-GEGEVENS KONINKLIJKE BIBLIOTHEEK, DEN HAAG

Wieling, Myra

Discrepancies between demand and supply and adjustment processes on the labour market / Myra Wieling and Lex Borghans. - Maastricht : Research Centre for Education and the Labour Market, Faculty of Economics and Business Administration, University of Limburg. - (ROA-RM-1995/4E)
Met lit. opg.
ISBN 90-5321-158-6
Trefw.: onderwijs en arbeidsmarkt.

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Abstract

Mismatches between demand and supply on the labour market do not lead automatically to unemployment in the case of excess supply or to unfilled vacancies or skill shortages in the case of supply shortages. However, the labour market is much more flexible. Individuals offering their skills in a surplus supply situation may accept jobs that are less attractive to them, such as jobs with lower wages or at a lower level, in order to improve their possibilities of getting a job. *Ex ante* forecasts of gaps between labour demand and supply should therefore not be interpreted as predictions of future unemployment, but as an indication of the adjustment necessary to bring the market back into equilibrium. This study examines the relationship between discrepancies between labour demand and supply on the one hand and manifestations of these tensions in the labour market experience of school-leavers on the other hand. To investigate this relationship, a random coefficient model has been used, which allows for different adjustment processes for the various educational types, but still makes full use of all the information available in the data. On average, supply surpluses lead to pressure to accept jobs at a level which is lower than the school-leavers educational level, jobs with relatively low wages, and/or jobs with part-time contracts. The fact that a direct link between supply surpluses and unemployment is found only at low educational levels suggests that excess supply generally has an indirect relation to unemployment, through a downward displacement process.

1 Introduction

The future prospects of particular types of education on the labour market are often investigated using separate projections of demand and supply. These manpower forecasts result in a forecast of the discrepancy between demand and supply for a certain type of education. The manpower requirements approach has frequently been criticized because of its naive implicit assumption that every type of education leads to a specific, exclusive, occupation. The approach is often thought to assume inelastic demand functions, in contrast to the so-called 'rates of return approach' in which complete elasticity is thought to be assumed (see Psacharopoulos, 1991).

These criticisms are however based on an extremely restrictive interpretation of the discrepancy between demand and supply. If indeed every occupation could only be performed by people of one specific type of education, a mismatch between demand and supply would immediately lead to unemployment in the case of excess supply or to unfilled vacancies or skill shortages in the opposite case. In practice, however, the labour market is much more flexible, and people who are offering their skills in the face of excess supply of workers of their educational type may switch to other markets, accept lower wages or accept labour contracts which are less attractive to them for other reasons, in order to improve their chances of getting a job. This flexibility of the labour market is reflected in the observation that most types of education are represented in a range of occupations, rather than in one specific occupation. Freeman (1980) illustrates this flexibility by showing that the actual employment situation is affected by both demand and supply.

The practice of manpower forecasting has, however, already been adjusted to allow for the labour market's capacity for flexible response. As Borghans and Heijke (1995) indicate, the gap between demand and supply should therefore not be interpreted as a prediction of future unemployment, but should be viewed as an indicator of the extent of the labour market adjustments that would be necessary to bring the market back into equilibrium. Even if one supposes that the market is completely cleared by wage adjustments, the gap between demand and supply at the wage level in the base year is an indicator of the expected wage changes. The best way to interpret the discrepancy is to regard this gap as the *ex ante* difference between demand and supply, i.e. before any adjustments have taken place. For example, if individuals have a hard time finding a job at a level that would normally match their educational background they may decide to accept a job that is below their educational level. However, these adjustment processes are probably not complete, implying that part of the workforce will be unemployed due to the excess supply situation. In that case unemployment — or at least the distribution of the unemployment over the educational groups — would partially be determined by quantitative mismatches between the numbers of school-leavers with a certain educational background and the requirements of employers for that educational type.

The Research Centre for Education and the Labour Market (ROA) makes manpower forecasts for the labour market in the Netherlands. These forecasts are incorporated in the information system on education and the labour market, which includes, among other things, the labour market prospects in the medium term for 49 types of education (see ROA, 1993a and 1993b). As in almost all manpower forecasting literature, these forecasts are based on separate, although not necessarily independent, predictions of demand and supply, as described above. This implies that the discrepancy between demand and supply in these forecasts should be interpreted as *ex ante* predictions. These forecasts therefore only give an indication of the future scarcity in different segments of the labour market, without taking account of the various adjustment processes in each segment.

The observation that the labour market is in reality flexible, and therefore that *ex ante* discrepancies will not automatically result in *ex post* unemployment, leads to the question of how these *ex ante* discrepancies relate to the adjustment processes on the labour market. This study examines how discrepancies between demand and supply reveal themselves, using several key indicators that characterize the labour market position of types of education. This link between the theoretical concept of 'labour market discrepancies' and empirical facts such as wage movements, temporary or part-time jobs, jobs below the worker's educational level, and unemployment sheds light on two sides of the same coin.

Firstly, we investigate the extent to which these manifestations of labour market problems are caused by discrepancies between the education of the workforce and the needs of employers. With regard to unemployment, which is the most visible and probably the most unwanted labour market problem, this question is the counterpart of the discussion of whether shifts between economic sectors cause unemployment (Lilien, 1982, Blanchard and Diamond, 1989 and Hosios, 1994). This study will show that unemployment for a particular educational category is not, on the whole, clearly related to discrepancies between supply and demand, and that there may be other labour market phenomena (namely lower wages, under-utilization of education, and 'involuntary' part-time jobs) which are much more closely linked to discrepancies than unemployment. This contradicts the implicit assumption in many applied manpower projections, that discrepancies between the educational background of school-leavers and the requirements of employers inevitably lead to unemployment or unfilled vacancies. Layard and Nickell (1986) and Bean and Pissarides (1991) also fail to find any direct relationship between discrepancies at the occupational level and unemployment. However unemployment as a result of discrepancies between supply and demand may be important for some specific types of education.

Secondly, this study will affirm the significance of the manpower requirement approach. Although discrepancies between demand and supply per educational type do not always lead directly to unemployment, it is still true that if the number of school-leavers with a

particular educational background exceeds the *ex ante* requirements of employers, they will face many difficulties in finding an appropriate job. Forecasts of these surpluses are therefore an important tool to avoid matching problems on the labour market. However, the above observations concerning the nature of the adjustment processes imply the need for a more sophisticated approach to the meaning of labour market discrepancies.

Besides these findings at an analytical level, the present study also opens up possibilities for extending the current practice in manpower forecasting. As a result of this research, manpower forecasts can be extended to include not only predicted mismatches, but also forecasts of how the labour market can be expected to react to the mismatches. This will mean that manpower forecasts which are used for educational and vocational guidance purposes, in order to inform students about the prospects which various types of education are expected to offer, can provide more adequate information about the type of labour market problems which are to be expected in the short to medium term.

This study is based on two annual Dutch school-leaver surveys, which investigate the position of the young people who completed their initial education approximately one year previously. We have selected data from these surveys on seven aspects which characterize the labour market position of school-leavers. These are: the percentage of school-leavers who are unemployed, the percentage of school-leavers who earn a relatively low (monthly or hourly) income, who have a job at a level which is lower than their educational level, who have a job which does not match the discipline or field of study in which they are qualified, and the percentage of school-leavers with temporary or part-time jobs.

Since it combines manpower forecasts with information on the situation that school-leavers encounter on the labour market, this study is divided into two parts. Firstly, the gap between labour demand and supply is evaluated, and the data used in calculating this gap is discussed. Then the relation between this gap and the various aspects of the labour market position of school-leavers is examined. This relationship is investigated using a random coefficients model, which enables us to find a compromise between pooling all the observations of all types of education and measuring the relationships separately for each educational type. The former approach would disregard the idiosyncrasy of some types of education, but lack of data prevents a completely separate treatment of every type of education.

The structure of this study is as follows. Section 2 illustrates a theoretical approach to the adjustment processes. Section 3 describes how the forecast gap between labour demand and supply of a particular educational type is determined. Section 4 discusses the construction of the data used in determining the forecast gap. Section 5 then presents the resulting forecasts of the *ex ante* gap between labour demand and supply. The modelling of the adjustment processes will be detailed in section 6. The school-leaver data used to

analyze the adjustment processes is described in section 7, and the results are given in section 8. Section 9 illustrates how the results of this study could be used to compile additional information for educational and vocational guidance purposes, by means of some examples of ROA's forecasts of educational prospects, based on projections for 1998. Finally, section 10 summarizes the results and draws some conclusions.

2 Adjustment processes on the labour market

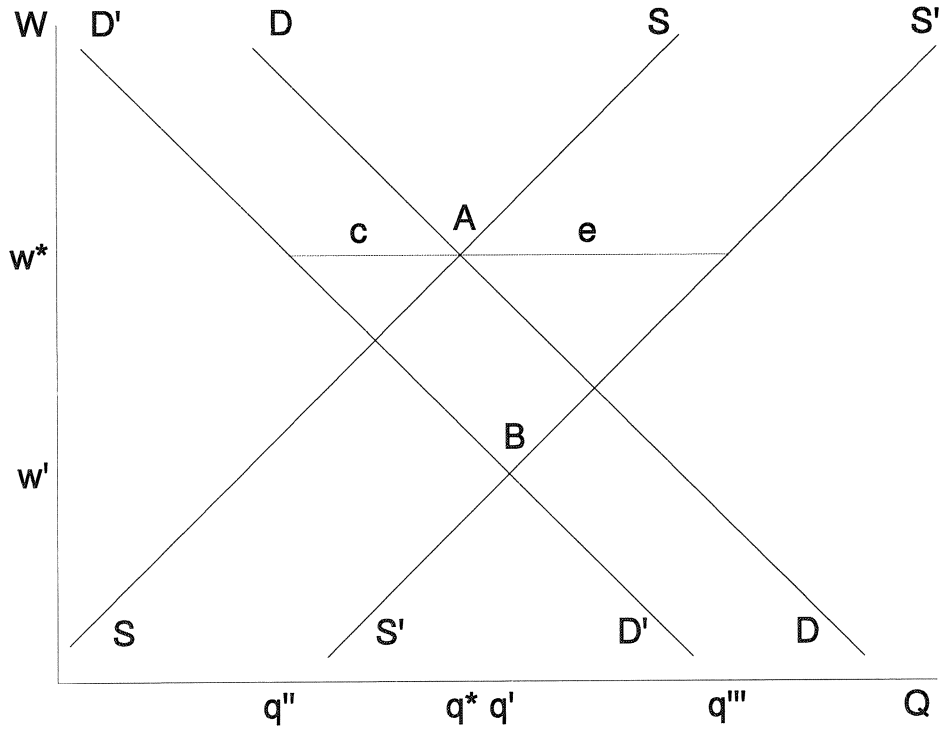
As was said in the introduction, the manpower requirement approach, in which separate forecasts of changes in demand and supply are made, is often interpreted as assuming inflexibility of demand and supply (see Blaug, 1967, and Freeman, 1980). A forecast of demand *per se* and supply *per se* can only be made if there is no interaction between demand and supply. If there are interactions between demand and supply, the actual observed demand will be dependent on the supply curve, and *vice versa.* In many manpower studies, a discrepancy between demand and supply is almost automatically interpreted as a direct prediction of unemployment or skill shortages. Borghans, Van Eijs and De Grip (1994) argue, however, that it is not realistic to assume such a rigid relationship between gaps between demand and supply and unemployment.

In Borghans and Heijke (1995) it is pointed out that the discrepancies which are predicted in manpower requirement analyses should not be interpreted strictly as pointing to *ex post* shortages or surpluses. It is more realistic to view the supply-demand gaps as indicators of adjustments which will have to take place in order to bring demand and supply into equilibrium. Figure 1 depicts a situation in which demand and supply for labour with a certain type of education are not fixed, but depend on wages. Forecasts of demand and supply in such a situation are conditional forecasts, given a certain wage level. Manpower forecasting methods usually do not explicitly say what wage levels are assumed, but it is implicity obvious that projections of demand and supply are based on current circumstances in the labour market. Such manpower requirement projections are therefore *ex ante* projections, i.e. projections which do not incorporate changes in the market situation.

On the basis of manpower forecasts, an *ex ante* indication can be obtained of the scarcity or surplus in particular segments of the labour market in the near future, without allowing for adjustment processes. However, in a situation of excess supply, unfavourable prospects can be expressed in unemployment, but also in lower wages, employment at a lower level or in a branch other than the one for which one was educated, or in temporary or part-time jobs. The size of the *ex ante* gap between demand and supply can serve as an indication of the magnitude of the adjustments which will take place. This section will illustrate these adjustment processes and their relationship to discrepancies between demand and supply.

In figure 1, the demand and supply curves, ***D*** and ***S*** respectively, in the initial situation intersect at equilibrium point ***A***. At this equilibrium, the wage is ***w****. Both the demand and supply curves shift, however, to ***S'*** and ***D'*** respectively. Calculating demand and supply at the wage paid under the former equilibrium leads to the *ex ante* demand and supply. *Ex ante* supply increases, in this situation, from ***q**** to ***q'''***, while *ex ante* demand falls from ***q**** to ***q''***. If there are no rigidities in the labour market, adjustment processes will lead to the *ex post* equilibrium situation ***B***, with supply equalling demand at ***q'*** and the wage equal to ***w'***.

Figure 1
Discrepancies between demand and supply for a certain type of education on the labour market



The usefulness of a manpower requirement forecast of the *ex ante* gap between demand and supply is that, given the slopes of the demand and supply curves, the change in wages (***w'*** – ***w****) needed to bring the market to equilibrium is proportional to the *ex ante* discrepancy ***c*** + ***e***. Therefore, a forecast of the gap between demand and supply can in this case be treated as an indicator of the magnitude of the expected wage movement.[1]

1. However Van Eijs (1994) observes that comparisons of these *ex ante* shortages or surpluses between different types of education presume similar elasticities of demand and supply in the different sub-markets. This implies that a comparison of the gaps faced by different types of education requires an analysis of the effects of a gap on the labour market position, as is done in this paper.

The argument that there is a direct relationship between the *ex ante* discrepancy between demand and supply and the adjustments needed to bring the market for a certain type of education into equilibrium also holds if the market is not cleared by wages, but rather by another aspect of the labour contract. If individuals have difficulty in finding work they may decide to accept a job at a level below the level of their education. They might also look for a job in segments of the labour market for which they were not educated. Moreover, in a situation of excess supply, individuals will be more likely to accept temporary or part-time jobs. Thus the labour market will not in practice adjust in just one dimension. There will be a number of reactions which together create a tendency to move towards an equilibrium. One would expect, however, that all the adjustments will, in the case of an *ex ante* surplus of workers with a certain educational background, be at the expense of suppliers and will benefit the demanders. The *ex ante* gap therefore remains an adequate indicator of labour market prospects, in the widest sense.

All these adjustments assume that the market will come back in equilibrium, i.e. it is assumed that supply will eventually equal demand. However, it is also possible that adjustments will not be complete, so that some of the suppliers of labour will in the end be unemployed. This situation is illustrated in figure 2, where there is a wage adjustment of magnitude ***h*** towards ***w"***, which results in an *ex post* forecast of the number of individuals who are unemployed of ***f*** + ***g***. This illustrates that manpower requirement forecasts of the discrepancies between demand and supply do not only make sense in the case of determining the future labour markes position by the probability of getting unemployed, but that other labour market aspects, can also be incorporated in this framework. In the described adjustment process the probability that individuals get unemployed decreases, although individuals will have to accept lower wages. Figure 2 shows that it is possible to relate the *ex ante* supply surplus (***c*** + ***e***) to both labour market adjustments (***h***) and unemployment (***f*** + ***g***).

Unemployment seems to be a special indicator in the list of possible adjustments, containing the difference between demand and supply for which no adjustments are made. It is, however, also possible to regard unemployment as one of the adjustments that will take place in order to diminish the difference between *ex ante* demand and supply. The general aspect of all these adjustments is that they are unfavourable to the suppliers of work and favourable to the demanders. Worsening of the various labour market aspects will then cause a withdrawal of supply and a raise in the demand, which will bring demand and supply towards an equilibrium. In the case of a rise in the unemployment, there will also be a withdrawal of supply of labour. The number of people that actually has a job decreases as unemployment rises, i.e. as the labour market situation worsens.

Figure 2
Process of adjustment on the labour market

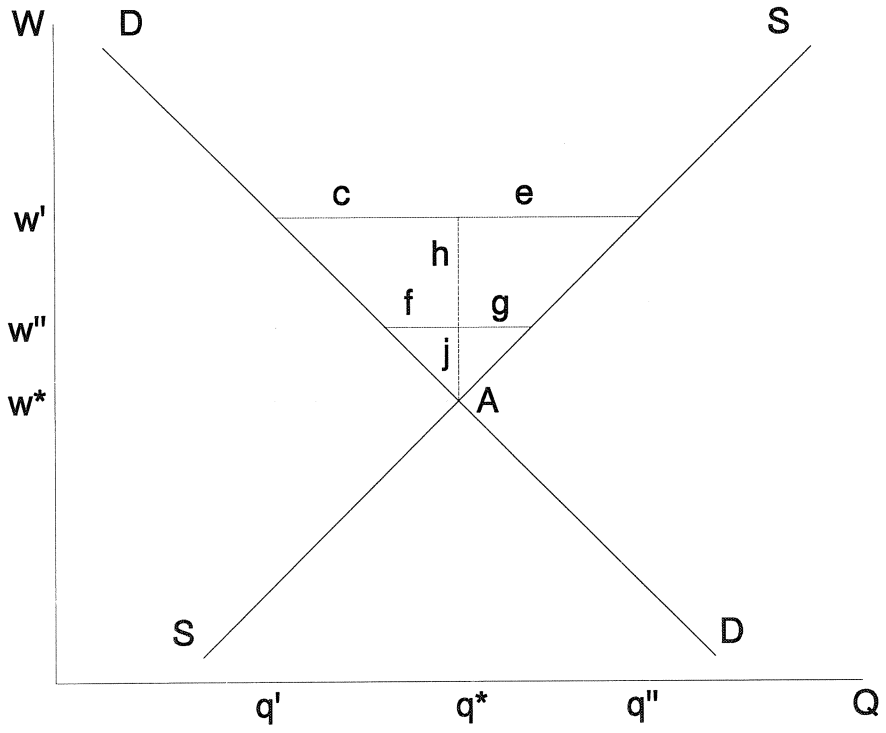
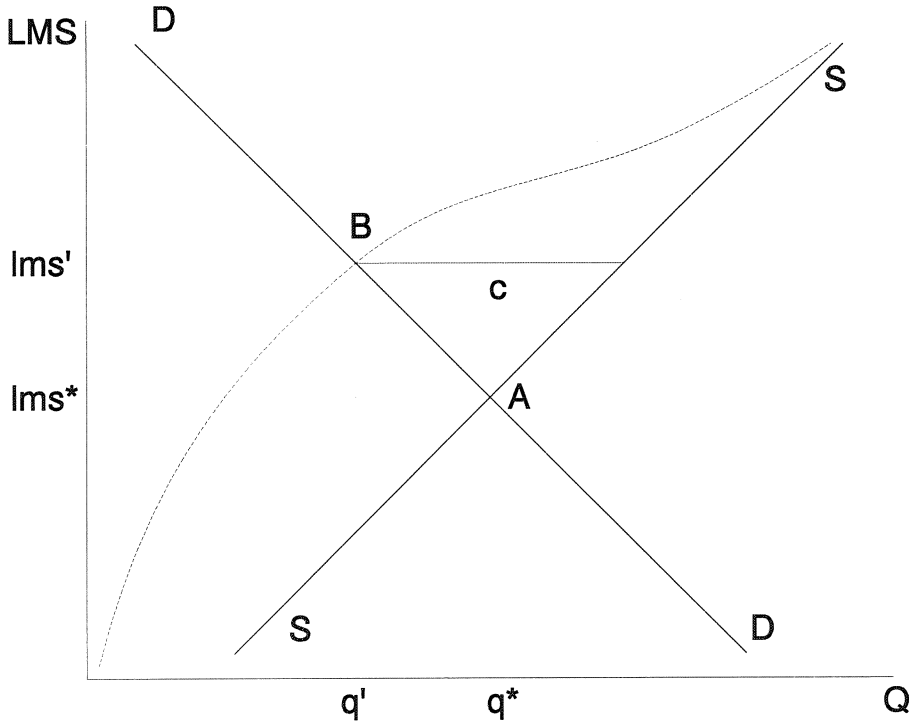


Figure 3 shows how the labour market model can incorporate the multiple aspects that characterize the labour market situation (***LMS***), rather than just wage levels. Again the labour market would be in equilibrium at point ***A*** with quantity q^* and the labour market situation lms^*. In this figure, one of the aspects of the labour market situation is the level of unemployment. By examining the relation between *ex ante* surpluses of labour and all of the aspects that characterize the labour market position of individuals, it is possible to determine what percentage of the supply of labour will be unemployed in various labour market situations. Based on this information, it is possible to plot the portion of the supply which will actually be employed at a certain level of the ***LMS***. This is the dotted line in figure 3. If the labour market situation is lms', the number of unemployed individuals is ***c*** and the actual situation on the labour market is characterized by point ***B***.

This augmented supply curve will, by definition, cross the demand curve at a point representing the actual labour market situation. The situation is therefore automatically interpreted as an equilibrium in which the level of unemployment is internalised in the labour market situation. Such a construction of an augmented supply curve presumes however that, for a given level of ***LMS***, there is only one set of levels of the various labour market aspects which are being considered (including unemployment).

Figure 3
Actual situation on the labour market



This construction of an augmented supply curve shows that it is possible to regard changes in the labour market position of a type of education as an adjustment in response to *ex ante* discrepancies between demand and supply. It shows that the manpower requirement approach is useful not because all discrepancies lead directly to unemployment or unfilled vacancies, but because changes in the labour market position, including unemployment levels, are to a significant extent caused by the quantitative *ex ante* discrepancies. In this perspective, unemployment and other indicators of tension, such as workers accepting lower-level jobs or temporary jobs, are points along a continuum.

3 The discrepancy between demand and supply

In order to investigate the relationship between the *ex ante* discrepancy between demand and supply and the adjustments this leads to, the gap itself has to be determined. This gap is the difference between demand and supply given the labour market conditions in a certain base year. Since demand and supply can only be observed under actual labour market conditions, this requires a theoretical framework to project the demand and supply figures needed for the manpower requirement approach. Supply can simply be

determined as the sum of the workforce and the number of people unemployed, assuming that it is not possible for people to change their educational background in the short term, and that nobody will withdraw because of the labour market conditions. These assumptions imply an inflexible supply curve. No such direct measurement is possible for demand, so a theoretical framework has to be used. The most straightforward way to calculate demand given the labour market conditions in the base year is to use a fixed coefficient model. This assumes that if labour market conditions do not change, the demand for each type of education within this occupation is a certain constant fraction of the total demand in that occupation. If the employment for a certain occupation grows, the demand for the various types of education represented in this occupational field rises proportionally. It is assumed that the total demand in an occupation does not depend on the labour market conditions.

The fixed coefficient demand is therefore determined by the following equation:

$$\hat{e}_{ij}^{t+1} = \frac{e_{ij}^{t}}{e_{i.}^{t}} \cdot e_{i.}^{t+1} \qquad (3.1)$$

where:

e_{ij}^{t} = number of workers in occupation *i* with education *j* in period *t*

$e_{i.}^{t}$ = total number of workers in occupation *i* in period *t*

$\hat{e}_{ij}^{t+1}$ = predicted number of workers in occupation *i* with education *j* in period *t+1*

Borghans and Heijke (1995) provide alternatives for this fixed coefficient model, which make allowance for some autonomous changes in the demand for types of education, in addition to the occupational effect. Dekker *et al.* (1993) provide the specification of the demand model actually used in the ROA forecasts. In this model the *ex ante* demand per occupational segment *i* and educational type *j* is determined by the educational structure per occupation *i* in period *t–1*. On the basis of downward displacement and the degree of concentration around the average educational level of each occupation, this structure changes each year according to the following formula (see Borghans and Heijke, 1995):

$$a_{ij}^{t} = e_{ij}^{t} \cdot e^{\left(-\frac{1}{5}\gamma_1(5-l_j)\right)} \cdot e^{\left(-\frac{1}{5}\gamma_2 \mid l_j - l_i^{t-1} \mid\right)} \qquad (3.2)$$

where:

a_{ij}^{t} = relative number of workers in occupation *i* with education *j* according to the adjusted educational structure in period *t*

l_j = the level of education *j* (1 for primary education and 5 for university)

l_i^{t-1} = the average educational level in occupation *i* in period *t–1*

γ_1 = coefficient that indicates the extent of downward displacement over 5 years (= 0.09)

γ_2 = coefficient that indicates the degree of concentration over 5 years (= 0.01)

This adjusted educational structure is then used to forecast the demand for each occupation, in a way analogous to the fixed coefficient model:

$$\hat{e}_{ij}^{t+1} = \frac{a_{ij}^{t}}{a_{i.}^{t}} \cdot e_{i.}^{t+1} \qquad (3.3)$$

where:

$$a_{i.}^{t} = \sum_{j} a_{ij}^{t}$$

Based on a theory which explains the demand for each type of education within each occupation, and the assumptions about constant supply, the *ex ante* discrepancy between demand and supply for each educational type can now be determined, in two ways. Firstly, the gap can be computed on the basis of the whole labour force. Secondly, the gap between labour demand and supply can be determined on the basis of flows of newcomers entering the labour market and the numbers of job openings. The latter method is used in the ROA forecasting model to determine the medium term labour market perspectives per type of education.

If the first method is to be used, the forecast of total demand for labour for each type of education is calculated on the basis of a demand model as follows:

$$D_{j}^{t+1} = \sum_{i} \hat{e}_{ij}^{t+1} = \hat{e}_{.j}^{t+1} \qquad (3.4)$$

where:

D_{j}^{t+1} = forecast of demand for type of education *j* in period *t+1*

Supply is determined using the following equation:

$$S_{j}^{t+1} = \sum_{i=1}^{n} e_{ij}^{t+1} + u_{j}^{t+1} = e_{.j}^{t+1} + u_{j}^{t+1} \qquad (3.5)$$

where:

u_{j}^{t+1} = numbers of worker with type of education *j* who had been unemployed for less than one year in period *t+1*

S_{j}^{t+1} = supply from the type of education *j* in period *t+1*

$e_{.j}^{t}$ = total number of workers with education *j* in period *t*

This equation assumes that, apart from the people in the workforce, only the short-termed unemployed can be treated as a source of supply which is able to compete with others in the labour market. The equations for demand and supply together result in the gap between the demand for and the supply of labour for each type of education:

$$GAP_j^{t+1} = D_j^{t+1} - S_j^{t+1} \qquad (3.6)$$
$$= \hat{e}_{.j}^{t+1} - (e_{.j}^{t+1} + u_j^{t+1})$$
$$= \hat{e}_{.j}^{t+1} - e_{.j}^{t+1} - u_j^{t+1}$$

where:
GAP_j^{t+1} = gap between labour demand and supply for type of education *j* in period *t+1*

The second method of calculating this gap, as used in the ROA forecasts, is based on the flows of newcomers and job openings. The demand for newcomers, i.e. the job openings, consists of the expansion demand and the outflow of workers leaving the workforce and is determined as follows:

$$D_j^{t+1} = \hat{e}_{.j}^{t+1} - e_{.j}^{t} + o_j^{t+1} \qquad (3.7)$$

with: o_j^{t+1} = outflow of workers with education *j* in period *t,t+1*

The supply of newcomers, inclusive short-term unemployed, on the labour market per type of education is calculated as follows:

$$S_j^{t+1} = e_{.j}^{t+1} - e_{.j}^{t} + o_j^{t+1} + u_j^{t+1} \qquad (3.8)$$

This results in a gap between the demand for and the supply of newcomers on the labour market for each educational type which equals of course the gap calculated based on the whole labour force:

$$GAP_j^{t+1} = D_j^{t+1} - S_j^{t+1} \qquad (3.9)$$
$$= \hat{e}_{.j}^{t+1} - e_{.j}^{t} + o_j^{t+1} - e_{.j}^{t+1} + e_{.j}^{t} - o_j^{t+1} - u_j^{t+1}$$
$$= \hat{e}_{.j}^{t+1} - e_{.j}^{t+1} - u_j^{t+1}$$

The second method of calculating the gap between demand and supply is based on the assumption that newcomers are confronted with all the consequences of discrepancies between demand and supply. Since people who are already employed will not be easily threatened by newcomers, this assumption is plausible. However, the assumption about who bears the consequences has no influence on the absolute size of the shortage or surplus. The assumption only matters when calculating the relative size of the gap. If newcomers face all discrepancies the total number of newcomers has to be in the denominator, whereas if the whole labour market might face matching problems, the total size of an educational group on the market has to be in the denominator. Because figures on worker outflows are lacking for the years investigated here, the latter approach is

followed. If figures on flows become available, however, it will be very interesting to compare the two methods, perhaps indicating the superiority of one of the two assumptions.

4 Data on the labour force

The Dutch Labour Force Survey (LFS) is used to calculate the *ex ante* gap between labour demand and supply. The LFS is a continuous monthly survey that has been carried out since 1987 by Statistics Netherlands (CBS). The yearly sample of the LFS includes about 120,000-130,000 addresses, with about 100,000 to 110,000 individuals between the ages of 15 to 64 years old being interviewed, a sample fraction of 1%. Eventually, the results of the sample are scaled up to the size of the Dutch population. This scaling up involves a stratification by sex, age, marital status, nationality and region (CBS, 1993). Together with information from the Employment Board concerning the numbers of registered unemployed, this provides information about the whole workforce.

The LFS provides information on the type of education an individual has completed and the occupation he or she works in. Together with data about the numbers of unemployed, it is possible to determine the *ex ante* gap between labour demand and supply in the way described in the previous section. Information on the occupation the individuals work in is available, going back to 1988. However, data on their educational backgrounds is only available since 1990. This implies that the gap between labour demand and supply per educational type can only be determined for 1991 and 1992, since 1990 must be the base year.

Furthermore, for reasons of privacy the CBS imposes restrictions on the publication of information originating from the LFS, as a result of which numbers smaller than 5,000 cannot be published, although data with a lower bound of 2,500, rounded off to multiples of 500, can be used for model calculations. These restrictions, however, mean that part of the data is missing. In order to calculate the gap between labour demand and supply for each educational type, however, it is necessary to have a full indication of the educational backgrounds of individuals with a certain occupation. Therefore the possible non-zero unknown elements in the matrices of occupational segments by educational type are 'filled'.

To fill the matrices of occupational segments by educational type for 1990, 1991 and 1992, the number of workers per occupational segment and educational type of 1985 and the average number of workers per occupational segment and educational type in the period 1990-1992 are used. The first figures originate from the predecessor to the LFS, the Labour Force Count (LFC). The LFC was held biannually until 1985, and provides the exact numbers of surveyed workers per occupational segment and type of education.

Average numbers from the LFS in the period 1990-1992 are under somewhat less stringent restrictions: the publication threshold is 2,000.

The matrices for 1990, 1991 and 1992 are then filled in in two steps. First, averages for the period 1990-1992 concerning the matrix of occupational segments by educational type are filled on the basis of the educational structure of the occupational segments in 1985. Then the unknown cells of the matrices for the separate years 1990, 1991 and 1992 are filled with the educational structure of the occupational segments from the newly-created 1990-1992 matrix.

First the total number of people in a certain occupational segment, of which the educational background of the workers in 1990-1992 is unknown, has to be determined:

$$g_{i.} - \sum_{j} g_{ij} = \delta_i \qquad (4.1)$$

where:

g_{ij} = number of workers in occupation *i* for which the educational background *j* is known in the matrix of averages for 1990-1992

$g_{i.}$ = total number of workers in occupation *i* in the matrix of averages for 1990-1992

δ_i = number of workers in occupation *i* for which the education *j* is unknown in the matrix of averages for 1990-1992

Next, for each occupational segment, the number of workers of the educational types that are unknown in the matrix of averages over 1990-1992 are summed on the basis of the matrix of 1985:

$$\sum_{j\,:\,b_{ij}=0} f_{ij} = \xi_i \qquad (4.2)$$

where:

f_{ij} = number of workers in occupation *i* with education *j* in 1985

ξ_i = total number of workers in occupation *i* in 1985 for those educational types *j* that are unknown in the matrix of averages for 1990-1992

Then the ratios of each educational type to the number of workers per occupational segment is determined, for those educational types that are unknown in the matrix of averages for 1990-1992.

$$\frac{f_{ij}}{\xi_i} = \varphi_{ij} \quad \text{if } g_{ij} = 0 \qquad (4.3)$$

where:

φ_i = share of the educational type j in the total number of workers in occupation i in 1985, for those educational types that are unknown in the matrix of averages for 1990-1992

Eventually h_{ij} is the filled matrix of occupational segment by educational type over the period 1990-1992.

$$h_{ij} = \begin{cases} \varphi_{ij} \cdot \delta_i & \text{if } g_{ij} = 0 \\ b_{ij} & \text{if } g_{ij} \neq 0 \end{cases} \qquad (4.4)$$

This newly created matrix of averages over 1990-1992 is used to fill the matrices of occupational segments by educational type for 1990, 1991 and 1992. The annual LFS data is filled in using this adjusted matrix of averages, in way a analogous to the filling-in of the averages of 1990-1992 using LFC data.

5 The gap between demand and supply

Since the data for calculating the gap between labour demand and supply is available from 1990 to 1992, and a base year is needed, it is only possible to determine the gap for the years 1991 and 1992. Table 1 presents the gaps between labour demand and supply for these two years for the types of education for which data about the adjustment processes is also available. This school-leaver data is described in section 7.

The table presents both the gap based on the fixed coefficient model and the gap based on the demand model of Borghans and Heijke (1993). The latter is used in examining the influence of the forecast discrepancies on the labour market position of school-leavers, since it describes the structure of the demand for labour with a certain educational background best. However, it must be remarked that the estimation results in this paper, based on the Manpower Model with Substitution (MPS) of Borghans and Heijke (1995), are very similar to the results when the fixed coefficient model is used, which implies that the findings are quite robust in this respect.

The gaps are presented as percentages of the working labour force in the respective years. It can be seen that the excess supply surplus for 'Lower general secondary education' diminishes in 1992. For 'Higher general secondary education' the excess supply increases in 1992. The excess supply for workers with 'Preparatory vocational education, technical' changes into a surplus of demand in the year 1992. For 'Preparatory vocational education, commerce and administration' the opposite process has taken place. Using the fixed coefficient model, 'Preparatory vocational education, agricultural' is characterized by excess supply in 1991, whereas in 1992 demand is forecast to be equal

to supply. There is also an excess supply of workers with 'Preparatory vocational education, community care, hotel and catering', but it diminishes in 1992.

Table 1
The gap between labour demand and supply for 1991 and 1992, in percentages of the working labour force in the respective years, by type of education

Type of education	fixed coefficient model gap 1991 %	fixed coefficient model gap 1992 %	MPS gap 1991 %	MPS gap 1992 %
Lower general secondary	-15	-6	-16	-7
Preparatory vocational				
Agricultural	-3	0	-3	-1
Technical	-4	9	-5	8
Commerce and administration	15	-8	14	-9
Community care, hotel and catering	-9	-3	-10	-4
Higher general secondary	-17	-20	-17	-20
Intermediate vocational				
Agricultural	-10	-7	-9	-6
Non-medical laboratory	-15	-10	-15	-10
Engineering	-3	0	-3	1
Medical laboratory	24	-16	24	-16
Nursing and paramedical services	-8	-4	-8	-4
Commerce and administration	-3	0	-3	0
Social and cultural	-26	-26	-26	-26
Community care	-7	-4	-6	-3
Hotel, catering and hairdressers	1	-13	1	-12
Higher vocational				
Teacher training	-4	-5	-4	-5
Non-medical laboratory	-27	-2	-27	-1
Engineering	2	-16	4	-15
Medical laboratory	-10	-8	-10	-7
Nursing and paramedic	-7	-16	-6	-15
Commerce and administration	-7	-9	-6	-7
Business administration technology	-44	-43	-44	-42
Administrative, legal and fiscal	-2	-17	-1	-17
Social and cultural	-10	-16	-9	-15
Fine Arts	-25	-20	-24	-19
Other	178	49	182	51

Source: ROA

The surplus on the supply side of the labour market for 'Intermediate vocational education, engineering' changes between 1991 and 1992 to a small excess demand, using the MPS. This corresponds to the situation for 'Preparatory vocational education, technical'. For 'Intermediate vocational education, commerce and administration' the forecast demand in 1992 is equal to supply, whereas in 1991 there was a surplus supply. For the educational types 'Intermediate vocational education, medical laboratory' and 'Intermediate vocational education, hotel, catering and hairdressers', the surplus demand for labour in 1991 changes into a surplus supply of labour, but the alteration for the former educational type is more substantial than for the latter. It can also be seen that the excess supply of labour for 'Intermediate vocational education, agricultural', 'Intermediate vocational education, non-medical laboratory', 'Intermediate vocational education, nursing and paramedical services' and 'Intermediate vocational education, community care' all diminish.

In contrast to 'Intermediate vocational education, engineering', there is a small excess demand for 'Higher vocational education, engineering' in 1991, but in 1992 the supply of labour is forecast to be larger than the demand. It can also be seen that the supply surplus is increasing for the educational types 'Higher vocational education, nursing and paramedic', 'Higher vocational education, administrative, legal and fiscal' and 'Higher vocational education, social and cultural'. On the other hand the surplus supply is expected to decrease for 'Higher vocational education, non-medical laboratory' and 'Higher vocational education, Fine Arts'.

6 Modelling the effects of the gap on the labour market position

The main aim of this study is to investigate the relationship between *ex ante* discrepancies between demand and supply on the labour market, i.e. 'the gap', and manifestations of these tensions in the labour market experiences of school-leavers. The gap will cause changes in several facets of their labour market position. The relation between the gap and the seven selected key indicators is given by the following equations:

$$unemployment_{jt} = \beta_j^U \, gap_{jt} + \varepsilon_{jt}^U$$

$$hourly\,earnings_{jt} = \beta_j^H \, gap_{jt} + \varepsilon_{jt}^H$$

$$monthly\,earnings_{jt} = \beta_j^M \, gap_{jt} + \varepsilon_{jt}^M$$

$$job\,level_{jt} = \beta_j^L \, gap_{jt} + \varepsilon_{jt}^L$$

$$required\,branch\,of\,study_{jt} = \beta_j^B \, gap_{jt} + \varepsilon_{jt}^B$$

$$temporary\,job_{jt} = \beta_j^T \, gap_{jt} + \varepsilon_{jt}^T$$

$$part\text{-}time\,jobs_{jt} = \beta_j^P \, gap_{jt} + \varepsilon_{jt}^P$$

This relationship contains two simplifications. Firstly, it is not the change in unemployment, hourly wages, etc. which is modelled but the level. Secondly, the equations do not contain a constant term. Both simplifications are necessary because of the short time-series which are available thus far. The choice between changes versus levels is a disputable point. The indicators of the labour market position might point to a new equilibrium situation after the ratio of demand and supply has changed, but they might also point only to temporary disequilibrium situations. In the second case the disequilibrium is expected to disappear soon, and therefore the old situation can again be treated as the basic position. At least for unemployment this view might be very attractive. Once longer time-series are available, the relation between the gap and the change in the key indicators can be examined. The second simplification is that no constant terms are included in the equations. Because of lack of data, the assumption has been made that the constant term for each indicator, i.e. its level when the gap is zero, is equal for every type of education at a given educational level. All data has therefore been centred round the mean of all observations at a certain educational level.

One of the important problems encountered in examining the effects of a forecast gap on the various aspects of the labour market position of school-leavers is that, at a low level of aggregation, there is insufficient time-series data. This compounds the problems mentioned above, so that the parameter estimations will have a very low accuracy, i.e. large standard errors. There are two straight-forward ways to solve this problem. Firstly, pooling the various types of education, to increase the number of observations on which the estimations are based, may be a solution. In this case it is assumed that all types of educations react in the same way, which obscures an important labour market dynamic. The second way to avoid unreliable estimations is to collect time-series data over a longer period. Although longer time-series would be very useful in this case, their useful length is also restricted. Quite apart from the fact that longer time-series are currently not available, the use of longer time-series assumes that types of education react to gaps in the same way over time. This approach would obscure any structural change, which is very likely to occur since constant institutional changes will change the position of types of education.

In order to avoid pooling over educational types, or the alternative of waiting for longer time-series, the random coefficient model is used in this study to examine the influence of the gap on the various aspects of the labour market situation. In the random coefficient model, introduced by Swamy (1970; 1971), a compromise is made between the pooling of data and the estimation of individual equations, based on the accuracy of the estimation results. At the moment the time-series that can be used consists of only two observations. Therefore an extension of these series would, even within a random coefficient model, significantly increase the quality of the parameter estimates at the level of educational types.

For each educational type the following equation is estimated:

$$y_{ajt} = x_{jt}\beta_{aj} + \varepsilon_{ajt} \tag{6.1}$$

In this equation y_{ajt} stands for the value of labour market indicator $a \in \{u, ..., p\}$ for educational type j at time t, and x_{jt} is the gap between demand and supply for this type of education. This gap does not, of course, depend on a. In this model the parameter β_{aj} is independent of time, which implies that the influence of the gap on the selected indicators is constant over time. Furthermore, ε_{ajt} might correlate with other error terms $\varepsilon_{a'jt}$ if $a \neq a'$.

Using the notations $\beta_j = (\beta_j^U, ..., \beta_j^P)'$ and $y_{jt} = (y_j^U, ..., y_j^P)'$, it is possible to write equation (6.1) as:

$$y_{jt} = (x_{jt} \otimes I)\beta_j + \varepsilon_{jt} \tag{6.2}$$

Estimating this model by ordinary least squares (OLS) for each aspect a separately results in parameter estimates for each educational type. These estimates will diverge either because the actual values of the estimates differ, or because the error terms differ, or both. In the first case, one might regard the parameters of specific types of education as being drawn from a distribution of possible values of the parameters:

$$\beta_j = \bar{\beta} + \mu_j \tag{6.3}$$

where:

$\bar{\beta}$ = the mean parameter for all educational types

μ_j = the difference from the mean parameter per educational type j

assuming $E[\mu_j] = 0$, $E[\mu_j \mu_j'] = \Delta$ and $E[\mu_j \mu_k'] = 0$ for $j \neq k$.

The second case can be indicated by:

$$\hat{\beta}_j = \beta_j + \eta_j \tag{6.4}$$

where:

$\hat{\beta}_j$ = the estimated parameter for educational type j

η_j = the difference from the real parameter per educational type j

assuming $E[\eta_j] = 0$, $E[\eta_j \eta_j'] = \sigma_j^2 (X_j' X_j)^{-1}$ and $E[\eta_j \eta_k'] = 0$ for $j \neq k$.

Substituting the former equation into the latter equation gives:

$$\hat{\beta}_j = \bar{\beta} + \mu_j + \eta_j \tag{6.5}$$

This implies that the dispersion of the parameter estimations is caused by the dispersion

of the parameters between types of education and the standard errors of the individual OLS estimations.

For each educational type, the OLS estimations are the best linear unbiased estimations (BLUE), but in order to minimize the mean square errors (MSE) over all types of education, these OLS estimations can be improved (Swamy, 1970). This is done by determining the weighted average of the OLS estimations and $\bar{\beta}$. The optimal weight depends on the dispersion of the parameters over the educational types and the standard error of the OLS estimations. This implies that $\hat{\beta}_j$ is determined on the basis of the following estimator:

$$\hat{\beta}_j = \left(\Delta^{-1} + \Sigma_j^{-1}\right)^{-1}\left(\Sigma_j^{-1} b_j + \Delta^{-1}\hat{\bar{\beta}}\right) \tag{6.6}$$

where:

$$\Sigma_j = \begin{pmatrix} \sigma^2_{U_j} & 0 & \cdots & 0 \\ 0 & \sigma^2_{H_j} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \sigma^2_{P_J} \end{pmatrix} .(X_j' X_j)^{-1}$$

In the case of inaccurate parameter estimations for specific educational types and a small dispersion between types of education, $\hat{\beta}_j$ will be similar to the mean for all educational types $\bar{\beta}$. If on the other hand, the parameter estimations are fairly accurate and the dispersion between the educational types is large, $\hat{\beta}_j$ will tend to be equal to the parameter estimates of the OLS estimates b_j.

The introduction of a random element in the parameter for each type of education causes heteroscedasticity in the relationship if the data is being pooled. It is therefore efficient to use generalized least squares (GLS) to determine $\bar{\beta}$.

The GLS estimator for $\bar{\beta}$ is given by (see Judge, Griffiths, Hill and Lee, 1980):

$$\hat{\bar{\beta}} = \sum_{j=1}^{N} W_j b_j \tag{6.7}$$

where:

$$W_j = \left\{ \sum_{k=1}^{N} \left[\Delta + \Sigma_k\right]^{-1} \right\}^{-1} \left[\Delta + \Sigma_j\right]^{-1}$$

and

$$b_{aj}=\left(X_j' X_j\right)^{-1} X_j' y_{aj}$$

It has to be remarked that in determining the estimations of $\bar{\beta}$ in the first iteration of the model, the mean parameter for all educational types is determined on the basis of:

$$\bar{\beta} = \frac{1}{N}\sum_{j=1}^{N} b_j \tag{6.8}$$

The unknown variances σ_j^2 and Δ could be simply estimated by the following two formulas:

$$\hat{\sigma}_{jj} = \frac{\tilde{e}_j' \tilde{e}_j}{T - K} \tag{6.9}$$

in which $\tilde{e}_j$ are the residuals of $\tilde{e}_j = y_j - X_j b_j$, T represents the total periods of time in the analyses, K is the number of explanatory variables that are included, and, according to Swamy (1970),

$$\hat{\Delta} = S_b - \frac{1}{N}\sum_{j=1}^{N} \hat{\Sigma}_j \tag{6.10}$$

where:

$$S_b = \frac{1}{N-1}\left(\sum_{j=1}^{N} b_j b_j' - \frac{1}{N}\sum_{j=1}^{N} b_j \sum_{j=1}^{N} b_j'\right)$$

However, since the estimation of Δ may not result in positive semidefinite matrices, De Crombrugghe and Dhaene (1991) introduce an alternative estimator for Δ which is always positive and semidefinite. This estimator is obtained by the following iterative process:

$$F^{(1)} = S_b \tag{6.11}$$

$$F^{(n)} = F^{(n-1)}\left(F^{(n-1)} + \frac{1}{N}\sum \Sigma_j\right)^{-1} S_b$$

Convergence then gives an estimator for Δ which is always positive semidefinite:

$$F = \lim_{n\to\infty} F^{(n)} \tag{6.12}$$

In first instance it is assumed in the random coefficient model used that β_j^U, β_j^H, β_j^M, β_j^L, β_j^B, β_j^T and β_j^P are correlated:

Whereas ε_{jt}^U, ε_{jt}^H, ε_{jt}^M, ε_{jt}^L, ε_{jt}^B, ε_{jt}^T, and ε_{jt}^P are assumed not to be correlated:

$$\begin{pmatrix} \beta_j^U \\ \vdots \\ \beta_j^P \end{pmatrix} \sim N\left(\begin{pmatrix} \bar{\beta}^U \\ \vdots \\ \bar{\beta}^P \end{pmatrix}, \begin{pmatrix} \sigma^2_{\beta_U} & \cdots & \rho\,\sigma_{\beta_U}\sigma_{\beta_P} \\ \vdots & \ddots & \vdots \\ \rho\,\sigma_{\beta_U}\sigma_{\beta_P} & \cdots & \sigma^2_{\beta_P} \end{pmatrix} \right) \tag{6.13}$$

$$\begin{pmatrix} \varepsilon_j^U \\ \vdots \\ \varepsilon_j^P \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ \vdots \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma^2_{\varepsilon_U} & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & \sigma^2_{\varepsilon_P} \end{pmatrix} \right) \tag{6.14}$$

However, in testing this specification, the assumption of uncorrelated error terms had to be rejected, implying that the following specification is included in the model:

$$\begin{pmatrix} \varepsilon_j^U \\ \vdots \\ \varepsilon_j^P \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ \vdots \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma^2_{\varepsilon_U} & \cdots & \rho\,\sigma_{\varepsilon_U}\sigma_{\varepsilon_P} \\ \vdots & \ddots & \vdots \\ \rho\,\sigma_{\varepsilon_U}\sigma_{\varepsilon_P} & \cdots & \sigma^2_{\varepsilon_P} \end{pmatrix} \right) \tag{6.15}$$

Realising that the error terms of different aspects of the adjustment process might correlate, it is in fact more efficient (at least in very large samples) to estimate these equations simultaneously in a Seemingly Unrelated Regression (SUR) according to the following model (Zellner, 1962):

$$\begin{pmatrix} y_j^U \\ \vdots \\ y_j^P \end{pmatrix} = \begin{pmatrix} X_j & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & X_j \end{pmatrix} \begin{pmatrix} \beta_j^U \\ \vdots \\ \beta_j^P \end{pmatrix} + \begin{pmatrix} \varepsilon_j^U \\ \vdots \\ \varepsilon_j^P \end{pmatrix} \tag{6.16}$$

or alternatively,

$y = Z\gamma + \varepsilon$

It is assumed that $E[\varepsilon_j] = 0$ and $E[\varepsilon_j \varepsilon_k'] = \sigma_{jk} I_T$. Therefore the covariance matrix of the joint disturbance vector is given by

$$E[\varepsilon\,\varepsilon'] = \Omega = \Gamma \otimes I \tag{6.17}$$

where:

$$\Gamma = \begin{pmatrix} \sigma^2_U & \cdots & \sigma_{UP} \\ \vdots & \ddots & \vdots \\ \sigma_{UP} & \cdots & \sigma^2_P \end{pmatrix}$$

The γ, and therefore the β_j, is then estimated by GLS on the basis of the following

equation:

$$\hat{\gamma} = (Z'\Omega^{-1}Z)^{-1}Z'\Omega^{-1}y = (Z'(\Gamma^{-1}\otimes I)Z)^{-1}Z'(\Gamma^{-1}\otimes I)y \quad (6.18)$$

However, the SUR technique is only efficient if the sample is sufficiently large, which is not (yet) the case in the underlying study. Therefore this alternative has not been taken up here.

7 School-leaver data

In order to examine the effect of demand or supply surpluses on the various aspects of the situation on the labour market, indicated by a number of key indicators, data obtained from two large Dutch school-leaver surveys is used. These surveys are entitled the *'Registration of Outflow and Destination of School-leavers'* (Registratie van Uitstroom en Bestemming van Schoolverlaters (RUBS)) and the *'Higher Vocational Education Monitor'* (HBO-Monitor). These postal surveys examine the situation of school-leavers approximately one year after leaving school.

The RUBS project was initiated some years ago. It is a large-scale survey intended to periodically record the outflow and destination of school-leavers from secondary general and vocational education. The project consists of a written survey among graduates and drop-outs from general secondary education, preparatory vocational education and intermediate vocational education, approximately one year after they have left their education. The objective is to discover the first destination of school-leavers, to give a current picture of the position on the labour market and of the match between education and the labour market for various educational types.

In the RUBS project of 1992, a national random sample survey was realized for the first time, across the complete width of general secondary education, preparatory vocational education and intermediate vocational education. In all, 80,000 school-leavers from the 1990/1991 school year were approached. The response was approximately 55%, so information about the destination approximately one year after leaving school was obtained from more than 44,000 school-leavers (see Wieling, Van de Loo and Van der Velden, 1993a and 1993b). The RUBS project has continued in 1993, among school-leavers from 1991/1992. In that year some 47,000 school-leavers were approached and information on about 28,000 school-leavers was obtained (see Smoorenburg *et al.*, 1994).[2]

The HBO Monitor was developed in the course of 1990. It is an instrument for monitoring

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2. Note that those who do not successfully complete their courses are not taken into account in this study.

graduates from higher vocational education. Something over a year after completing their education, the graduates are sent a questionnaire, which generates a wide range of information on the first jobs of graduates. The target group of the HBO Monitor consists in principle of those who gained a certificate in the first phase of higher vocational education. In 1991 about half of the total outflow from higher vocational education, from the year 1989/1990, was sent a questionnaire, in total 16,000 graduates. The response rate was 62%, so that information was obtained from almost 10,000 school-leavers about their destination, somewhat over one year after graduating (see Van de Loo, Ramaekers and Van der Velden, 1992). In 1992 almost 20,000 graduates from higher vocational education in 1990/1991 were approached. The response was 56%, so information was again obtained for more than 10,000 school-leavers (see Van de Loo, Van der Velden and Wieling, 1993).[3]

Since the two school-leavers surveys have become available in recent years, it is not possible to use the older LFC data to determine the gap between labour demand and supply. This implies, as noted in section 4, that the gap can only be determined for the years 1991 and 1992. In order to measure the adjustment process on the labour market, the two best corresponding years are selected for each survey. For the RUBS project the years 1992 and 1993 have been selected. Since this survey was held in the Spring, selecting the years 1991 and 1992 would imply that only a small part of any expected adjustment processes affecting the demand would be evident.[4] The HBO Monitor is executed in the autumn, so the years 1991 and 1992 have been selected. The matching of the years in the respective surveys is summarized in table 2.

Table 2
Years included in analysis

Data	year 1		year 2	
LFS	Whole year	1991	Whole year	1992
RUBS	Spring	1992	Spring	1993
HBO	Autumn	1991	Autumn	1992

As mentioned earlier, for each year and for both surveys, seven dichotomous indicators were selected to give a description of the situation on the labour market. The key indicators are:

3. However the graduates who received part-time education are not included in this study, since these graduates were probably already active on the labour market during their study, which means that the information they provide does not necessarily refer to their first destination.

4. The demand forecasts are based on a year beginning 1 January.

1. percentage of school-leavers who are unemployed;
2. percentage of school-leavers who earn a relatively low hourly income;
3. percentage of school-leavers who earn a relatively low monthly income;
4. percentage of school-leavers who work at a level that is lower than their completed education;
5. percentage of school-leavers who work in a job for which another, or no (specific) branch of study, is required;
6. percentage of school-leavers who have a temporary job;
7. percentage of school-leavers who have a part-time job.

The first of the key indicators of the situation on the labour market is the unemployment of school-leavers. The percentage of school-leavers who are unemployed is determined by relating the unemployed school-leavers to the school-leavers who are in the labour force. An attempt was made to define unemployment among graduates using a definition of unemployment as close as possible to that used by the CBS (1993).[5] An exact match was not possible, mainly because the surveys provide no information on whether an 'unemployed' graduate has already accepted a job and is merely waiting to begin. Furthermore, the phrasing of the questions concerning unemployment differs in the two surveys.

To determine the hourly wages, the monthly earnings are first related to the number of hours which the graduates work per week. Then, to divide hourly and also monthly income into two categories, *per educational level*, the average income and standard deviation are determined. The incomes of the graduates, in both hourly and monthly terms, are then classified in one group with a relatively low income and a second group with an average or relatively high income.[6] The percentages of graduates who earn a relatively low monthly or hourly income is determined for those graduates who have a job for 12 hours or more per week (analogous to the definition of the CBS, 1993). It should be noted that in the RUBS project of 1992 the school-leavers were asked about their net monthly income, whereas in the same project in 1993, and in the HBO Monitors of 1991 and 1992, they were asked about their gross monthly wages. Therefore a dichotomous variable is expected to be the best way to compare the different surveys.

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5. This is based on the definition of the registered unemployed, the individuals between the ages of 16 and 64 who are not employed for 12 hours or more per week and who are available for a job of 12 hours or more per week, or who have accepted a job which will provide work for at least 12 hours per week.

6. The formula on the basis of which the classification is made, is $\mu - 0.524*\sigma$ (see Wieling, De Grip and Willems, 1990). The main disadvantage of this division is that *a priori* approximately 30% of all graduates of each educational level will be classified as having relatively low incomes. But this study focuses on the graduates from various types of education within one level, and it is not necessarily true that 30% of these graduates earn a relatively low income. Moreover, no more objective method of classifying income into two categories is available.

Table 3
Variables in percentages for junior secondary, preparatory vocational, senior secondary and intermediate vocational education for 1992

Educational type	unem-ployment %	low hourly wages %	low monthly wages %	low job level %	outside branch %	temp. work %	part-time work %
Lower general secondary	6	39	44	42	94	57	45
Preparatory vocational							
Agricultural	3	27	24	35	70	62	28
Technical	3	24	15	17	52	80	16
Commerce and administration	8	34	29	38	80	52	33
Community care, hotel and catering	9	39	33	31	77	56	34
Higher general secondary	5	68	71	63	86	61	38
Intermediate vocational							
Agricultural	2	34	35	28	49	22	13
Non-medical laboratory	5	5	5	15	28	44	4
Engineering	4	22	18	25	44	29	9
Medical laboratory	1	4	3	10	29	10	3
Nursing and paramedical services	2	14	18	15	33	29	17
Commerce and administration	5	36	25	22	58	25	9
Social and cultural	6	27	31	25	46	34	20
Community care	4	30	30	31	47	34	12
Hotel, catering and hairdressers	0	12	12	13	51	12	7

Source: ROA/RUBS 1992

Both surveys included a question about the type of education normally required for the job the graduates were holding at the time of the survey. These educational types are categorized into 6 educational levels.[7] The educational level that was required for the job that the graduate was holding is then compared with their completed educational level. A similar question was included about the branch of study that was required for the job the graduates held at the time of the survey, so that the percentage of school-leavers who

7. The required educational type are classified as follows:
   1 = no education or primary education
   2 = preparatory vocational education or lower general secondary education
   3 = apprenticeship system
   4 = intermediate vocational education, higher general secondary education
   5 = higher vocational education
   6 = university

held jobs for which no specific education, or education in another field, was required could be calculated. Both indicators, of level and field of study, are determined for the graduates who held a job for 12 hours or more per week.

Table 4
Variables in percentages for junior secondary, preparatory vocational, senior secondary and intermediate vocational education for 1993

Educational type	unem-ployment %	low hourly wages %	low monthly wages %	low job level %	outside branch %	temp. work %	part-time work %
Lower general secondary	9	25	50	55	100	55	56
Preparatory vocational							
Agricultural	3	28	27	19	63	58	34
Technical	5	23	20	6	45	51	16
Commerce and administration	13	21	29	15	74	36	33
Community care, hotel and catering	7	34	31	15	72	44	39
Higher general secondary	4	64	72	73	97	61	55
Intermediate vocational							
Agricultural	3	31	30	33	41	29	14
Non-medical laboratory	7	6	4	8	29	46	3
Engineering	6	25	24	30	46	30	12
Medical laboratory	2	4	2	10	42	11	2
Nursing and paramedical services	5	11	19	16	40	21	21
Commerce and administration	6	38	26	26	57	36	14
Social and cultural	7	25	36	25	51	34	28
Community care	4	21	28	27	46	27	18
Hotel, catering and hairdressers	2	13	21	17	47	33	20

Source: ROA/RUBS 1993

The last two key indicators refer to how many school-leavers have a temporary job or a part-time appointment approximately one year after completing their initial education. Part-time work is defined as less than 30 hours per week, and this, and the numbers with temporary work, are both related to the total number of employed school-leavers, i.e. those with a job for 12 hours or more.

It would also be interesting to include a variable for the graduates who enter another type of education due to the labour market situation. This so-called 'discouraged worker effect', in which students avoid unemployment by extending their educational careers, might also be an important way of adjusting to labour market discrepancies. However the data

available at the moment does not allow us to construct such an indicator.

Tables 3 and 4 present the percentages for these seven variables for the RUBS surveys of 1992 and 1993 respectively. Tables 5 and 6 show the percentages of the same variables for the HBO Monitor of 1991 and 1992 respectively.

With regard to unemployment, it can be seen from tables 3 to 6 that unemployment increases for almost every educational type in the second year. At the preparatory vocational education level, unemployment is relatively high for 'Commerce and administration' and 'Community care, hotel and catering', and it increases significantly in 1993 for the former educational type, while the latter type benefits from a slight decrease. Unemployment is low in both 1992 and 1993 for the educational types 'Intermediate vocational education, medical laboratory' and 'Intermediate vocational education, hotel, catering and hairdressers'. With regard to higher vocational education, it can be seen that in general a fairly large increase in unemployment took place from 1991 to 1992. Within higher vocational education, there is a large increase in unemployment for the educational types 'Teacher training', 'Non-medical laboratory', 'Engineering', 'Nursing and paramedic', 'Business administration technology', 'Social and cultural' and 'Fine Arts'. 'Fine Arts' is characterized by a large percentage of school-leavers who are out of work. For 'Administrative, legal and fiscal', there is no increase in unemployment from 1991 to 1992.

Table 5
Variables in percentages for higher vocational education for 1991

Educational type	unem-ployment %	low hourly wages %	low monthly wages %	low job level %	outside branch %	temp. work %	part-time work %
Higher vocational							
Teacher training	7	46	46	16	17	45	30
Non-medical laboratory	5	15	9	6	7	42	3
Engineering	9	10	3	12	11	25	1
Medical laboratory	3	56	13	15	7	41	0
Nursing and paramedic	4	27	37	24	10	24	24
Commerce and administration	6	22	12	21	29	26	4
Business administration technology	5	7	3	12	21	25	2
Administrative, legal and fiscal	6	24	10	24	37	36	5
Social and cultural	7	34	40	34	15	32	19
Fine arts	19	44	47	32	24	55	29
Other	7	28	18	32	45	41	5

Source: ROA/HBO Monitor 1991

The percentage of school-leavers from 'Lower general secondary education' who earn a relatively low hourly income decreased in 1993, as compared to 1992, but the percentage with relatively low monthly wages increased, implying that a larger proportion of school-leavers were working in part-time jobs. A decrease in the percentage of school-leavers earning relatively low hourly wages can also be seen for 'Preparatory vocational education, commerce and administration' and 'Preparatory vocational education, community care, hotel and catering'. These two educational types are characterized by comparatively large percentages of school-leavers with relatively low hourly incomes. For 'Preparatory vocational education, technical', there is a rise in the percentage of school-leavers who earn a relatively low monthly income.

At the intermediate level, there is a strong decrease in the percentage with relatively low hourly earnings for 'Intermediate vocational education, community care'. With regard to monthly wages, tables 3 and 4 show a decrease in the percentage of school-leavers of 'Intermediate vocational education, agricultural' earning a relatively low income. For 'Intermediate vocational education, engineering', 'Intermediate vocational education, social and cultural' and 'Intermediate vocational education, hotel, catering and hairdressers' there is an increase in the percentage of school-leavers earning a relatively low monthly income. It can also be seen that the laboratory training courses have only a comparatively small percentage of school-leavers with either relatively low hourly earnings or relatively low monthly incomes.

At higher vocational level, the percentages of graduates earning a relatively low hourly wages, and of those earning relatively low monthly incomes, both decreased for the educational types 'Teacher training', 'Medical laboratory', 'Commerce and administration', 'Administrative, legal and fiscal' and 'Fine Arts'. On the other hand, the percentage earning low wages increased for 'Non-medical laboratory' and 'Business administration technology', for both hourly and monthly earnings. For 'Higher vocational education, engineering', the percentage of school-leavers with low hourly or low monthly earnings is comparatively low.

With regard to the job level of the school-leavers, it can be seen that the percentage of school-leavers who are working at a level that is lower than their completed educational level has substantially increased for 'Lower general secondary education' and 'Higher general secondary education'. The educational types belonging to preparatory vocational education had smaller proportions of their school-leavers working at a relatively low level in 1993 than in 1992. The same applies at intermediate level for 'Intermediate vocational education, non-medical laboratory'. On the other hand the percentage of school-leavers with a relatively low job level increased for the educational types 'Intermediate vocational education, agricultural' and 'Intermediate vocational education, engineering'. For higher education, it can be seen that 'Higher vocational education, social and cultural' suffered an increase in the percentage of school-leavers working at a relatively low level. The

opposite occurred for 'Higher vocational education, fine arts'.

Table 6
Variables in percentages for higher vocational education for 1992

Educational type	unem-ployment %	low hourly wages %	low monthly wages %	low job level %	outside branch %	temp. work %	part-time work %
Higher vocational							
Teacher training	16	29	42	14	15	48	24
Non-medical laboratory	10	26	15	9	5	43	1
Engineering	14	9	7	13	10	37	2
Medical laboratory	5	32	13	19	1	38	0
Nursing and paramedic	9	28	40	21	7	26	20
Commerce and administration	9	17	11	19	21	31	2
Business administration technology	11	13	8	12	26	31	2
Administrative, legal and fiscal	6	13	13	21	33	38	9
Social and cultural	13	36	45	40	16	39	18
Fine Arts	28	36	39	19	21	55	28
Other	12	31	26	36	41	43	3

Source: ROA/HBO Monitor 1992

As would be expected, school-leavers with a general education are in most cases working in jobs for which no specific field of study was required. This percentage increased from 1992 to 1993. The percentage of school-leavers from preparatory vocational education who are working in job for which another qualification, or no specific branch of study, is required decreased. At intermediate level this is also the case for 'Intermediate vocational education, agricultural' and 'Intermediate vocational education, hotel, catering and hairdressers'. On the other hand, for intermediate vocational education in the fields of 'Medical laboratory', 'Nursing and paramedical services' and 'Social and cultural', the proportion is increasing. At the higher level, there was a decrease in the percentage of school-leavers working in another branch for 'Higher vocational education, medical laboratory' and 'Higher vocational education, commerce and administration'. In contrast, an increase in this percentage is seen for 'Higher vocational education, business administration technology'.

Tables 3 and 4 show that, from 1992 to 1993, there was an increase in the school-leavers from preparatory vocational education who had a temporary job. At intermediate level this also applies for 'Community care', 'Agricultural', 'Commerce and administration' and 'Hotel, catering and hairdressers'. At the higher level, the percentage of school-leavers

who are working in temporary jobs increased for 'Engineering', 'Commerce and administration', 'Business administration technology' and 'Social and cultural'.

Finally, as regards part-time work, there was an increase in the proportion of school-leavers from general education working in part-time jobs, but a decrease for 'Preparatory vocational education, agricultural' and 'Preparatory vocational education, community care, hotel and catering'. At intermediate level there was an increase in part-time work among school-leavers from 'Commerce and administration' 'Social and cultural', 'Community care' and 'Hotel, catering and hairdressers'. The proportion of graduates from 'Higher vocational education, teacher training' who worked in part-time jobs decreased.

8 Effects of the forecast gap on the labour market position

This section presents the estimation results of the model described in section 6. This model investigates the relation between discrepancies between labour demand and supply on the one hand and, on the other hand, some key indicators of the labour market position of school-leavers. A random coefficient model provides estimates for the relationship with regard to the various types of education, the averages of these relationships over all educational types, and the correlation structure between the types of education analyzed. The latter point, the covariance structure of the estimates, can be divided into two aspects: a covariance structure for the error terms in the estimated equations, and, since the parameters are stochastic, a covariance structure for the parameters. The error term structure indicates correlations in unsystematic deviations from the adjustment processes. If a key indicator is larger than might be expected from the gap, the correlation matrix points to other key indicators that are also likely to deviate.

From table 7 it can be seen that the error term in the unemployment equation does not correlate with any of the other key indicators which describe the labour market position of school-leavers. All other key indicators do have a positive significant correlation, except that the percentage of school-leavers with a temporary job does not significantly correlate with the percentage who have a part-time job or the percentage who are working in another branch. The lack of any significant negative correlation indicates that there seems to be no substitution between unsystematic adjustments. If, for example, the rise in the number of people getting a job below their educational level is larger than usually, this is not (significantly) compensated by a lower adjustment in other aspects. If one adjustment is larger than might be expected from the measured gap, all other adjustments also tend to be larger. This seems to imply that the gap-indicator does not explain all fluctuations in the labour market position of school-leavers, meaning that the gap-measure used — which is based on a rather simple model of demand — does not suffice to explain the actual labour market situation completely, or that the discrepancy between demand and supply does not determine completely the labour market position of a type of education. In

the first case, the model explaining the *ex ante* demand should be improved, possibly by using the school-leaver data used in this paper as data to estimate the model. In the second case, alternative explanations of the labour market position of school-leavers have to be investigated. The extent to which demand-supply discrepancies influence the labour market prospects of school-leavers determines the appropriateness of the manpower requirement approach as described in the introduction.

The second aspect concerning the correlation structure of the model concerns the correlation between the stochastic parameters. Since the adjustment parameters may vary between the types of education, it is possible that certain types of adjustment are more likely to be found in one group of educational types, while others are more dominant in the other group. Table 8 presents the correlation between the estimated β's. From the table it can be seen that the estimated parameter in the unemployment equation correlates with the estimated parameters in the other equations, with the exception of the relation between the gap and the percentage of school-leavers working in temporary jobs. Such a correlation indicates that types of education in which adjustment take place to a relatively large extent via unemployment, also have much adjustment in the (positive) correlating indicator. So types of education with relatively high amounts of adjustment via unemployment also have sharp adjustments via wages, having relatively many people working outside the branch, and relatively many part-time jobs. Relatively few adjustments are made in that case in the form of people getting jobs at lower levels. This latter finding can easily be explained by the process of downward displacement. For many types of education, low demand can be compensated for by accepting jobs below the usual level. Where downward displacement is not possible, for example at the lower educational levels or within certain very specific occupations, unemployment will increase instead.

Table 7
Correlation matrix of the error terms

Labour market aspects	unem-ployment	low hourly wages	low monthly wages	low work level	outside branch	temp. work	part-time work
Unemployment	1.00						
Hourly wages	0.06	1.00					
Monthly wages	0.23	0.75*	1.00				
Job level	0.16	0.49*	0.76*	1.00			
Required branch	0.22	0.38*	0.53*	0.71*	1.00		
Temporary	0.13	0.57*	0.40*	0.28*	−0.12	1.00	
Part-time	0.20	0.46*	0.84*	0.71*	0.66*	0.03	1.00

* = significantly correlated at 5% level

The two other correlations which are significantly negative are those between the temporary work parameter and the parameters concerning hourly wages and the field of study. Apparently there are certain types of education whose school-leavers keep on getting jobs within their own occupational domain when the market has a surplus, without a reduction in the wages. However, these jobs are on a temporary basis instead of a regular contract. Significantly positive correlations can be found between the temporary work parameter and the parameters that refer to the monthly wages, the job level, and part-time jobs. Furthermore, there is a positive correlation between the parameters for hourly and monthly wages, and also between the parameters of hourly wages and the field of study. Finally, table 8 shows a significant positive correlation between the parameters for part-time work and monthly wages.

Table 8
Correlation matrix of the estimated parameters

Labour market aspects	unem-ployment	low hourly wages	low monthly wages	low work level	outside branch	temp. work	part-time work
Unemployment	1.00						
Hourly wages	0.40*	1.00					
Monthly wages	0.66*	0.67*	1.00				
Job level	−0.53*	0.08	0.22	1.00			
Required branch	0.29*	0.51*	0.20	0.06	1.00		
Temporary	−0.13	−0.30*	0.37*	0.67*	−0.35*	1.00	
Part-time	0.61*	0.21	0.87*	0.22	−0.07	0.68*	1.00

* = significantly correlated at 5% level

The remaining results concerning the estimation of the adjustment model are the weighted average parameters of individual types of education. Before discussing the coefficients for particular educational types, the estimated $\bar{\beta}$ values are presented in table 9. One would expect a negative relationship between the *ex ante* discrepancies and the key indicators of the labour market situation. The t-values presented in the table are based on an equal weighting of all parameters, while the average parameter is based on the optimal weight, provided in section 6. Using the optimal weights would lead to a downward bias in the estimated standard errors. The alternative presented in this table is, on the other hand, too pessimistic regarding the standard errors.

The smaller the excess demand in the labour market (or the larger the excess supply), the larger the percentages of school-leavers who are unemployed, earn relatively low wages, work at a level below their completed educational level, work in a job for which no

particular qualification, or a qualification in another field of study was required, or have a temporary and/or a part-time job will normally be. It can be seen in table 9 that, with the exception of unemployment, the $\hat{\beta}$'s are negative as expected. The $\hat{\beta}$ representing unemployment has a small positive value. The parameter value for unemployment is however not significantly different from zero. There are four key indicators which are significantly influenced by the gap between demand and supply. These are monthly wages, hourly wages, job level and part time work. These results imply that, on average, a surplus of school-leavers of a certain educational type is absorbed by the labour market by their accepting jobs below their educational level. These jobs, which may be part-time, have a lower hourly payment and therefore the monthly wages, which are influenced by both the hourly wages and the number of working hours, are most strongly affected.

Table 9
Estimated mean of the OLS parameters per labour market aspect

Labour market aspects	$\hat{\beta}$	t-value
Unemployment	0.05	0.19
Hourly wages	−0.61*	1.90
Monthly wages	−0.63*	4.43
Job level below educational level	−0.33*	1.93
Required branch of study	−0.08	0.39
Temporary work	−0.37	1.41
Part-time work	−0.18*	1.95

It is very interesting to observe that unemployment is not significantly affected by a gap between demand and supply. Although the results are based on a limited data set, this is at least ground to reject the usual interpretation of manpower requirements forecasts, as predictions of unemployment only. Other adjustments also seem to be important. The importance of school-leavers shift to lower-level jobs as a reaction to a surplus reconfirms the impression that unemployment occurs, not directly as a result of surpluses, but only indirectly after a downward displacement process.

With regard to the estimation results, it has to be said that these are based on limited data, and furthermore that there are no constant terms included in the model. For unemployment among school-leavers it has also to be noted that there are large differences between the two years included in the model for a large number of educational types. The unemployment of school-leavers may be influenced by so many other factors that, without correction for these factors, the influence of the forecast discrepancies between labour demand and supply cannot be traced. However the implications about the lack of a direct link between the gap and unemployment remain valid.

Table 10
Estimated random coefficients

Educational type	unem-ployment	low hourly wages	low monthly wages	low job level	outside branch	temp. work	part-time work
Lower general secondary	−0.06	−1.19	−1.75	−0.63	−0.40	−0.68	−0.88
Preparatory vocational							
Agricultural	0.11	−0.66	−1.27	−0.97	−0.07	−1.09	−0.77
Technical	0.03	−0.86	−1.57	−0.90	−0.27	−1.04	−0.93
Commerce and administration	−0.10	−0.72	−1.10	−0.06	−0.06	−0.35	−0.57
Community care, hotel and catering	−0.02	−1.07	−0.96	−0.23	−0.29	−0.12	−0.19
Higher general secondary	−0.24	−1.18	−2.83	−0.69	−0.19	−1.31	−1.97
Intermediate vocational							
Agricultural	−0.00	−1.07	−1.13	−0.38	−0.22	−0.30	−0.34
Non-medical laboratory	0.11	0.00	−0.77	−0.68	0.33	−1.18	−0.75
Engineering	0.32	−0.14	0.63	−0.58	−0.09	−0.25	0.75
Medical laboratory	0.07	−0.69	−0.48	−0.34	−0.27	−0.22	0.03
Nursing and paramedical services	−0.03	−0.39	−1.09	−0.32	0.19	−0.79	−0.79
Commerce and administration	−0.08	−1.36	−1.74	−0.52	−0.45	−0.47	−0.75
Social and cultural	0.03	−0.55	−0.65	−0.26	−0.00	−0.39	−0.24
Community care	0.05	−0.92	−0.97	−0.45	−0.12	−0.40	−0.30
Hotel, catering and hairdressers	0.01	−0.16	−0.82	−0.38	0.17	−0.86	−0.69
Higher vocational							
Teacher training	−0.08	−1.41	−2.24	−0.87	−0.50	−0.92	−1.21
Non-medical laboratory	0.13	0.03	−0.18	−0.37	0.24	−0.68	−0.18
Engineering	0.21	0.57	0.24	−0.55	0.33	−0.99	−0.14
Medical laboratory	0.01	−1.22	−1.37	−0.55	−0.25	−0.44	−0.48
Nursing and paramedic	−0.04	−0.90	−1.26	−0.36	−0.09	−0.49	−0.60
Commerce and administration	0.13	−1.01	−0.31	−0.67	−1.08	−0.01	0.43
Business administration technology	0.15	−0.08	0.49	−0.22	−0.34	−0.07	0.56
Administrative, legal and fiscal	0.14	−0.30	−0.51	−0.96	−0.75	−0.88	−0.28
Social and cultural	−0.03	−1.10	−1.60	−0.57	−0.19	−0.66	−0.80
Fine Arts	−0.02	−0.95	−1.36	−0.51	−0.20	−0.60	−0.67

Table 10 presents the estimates of the random coefficient model for each educational

type.[8] As for the $\bar{\beta}$, the influence of the forecast discrepancies between labour supply and demand on the percentage of school-leavers who might really be unemployed is positive for several educational types. For every educational type, the gap has a negative effect on the percentage of school-leavers working at a level below their completed educational level and on the percentage of school-leavers having a temporary job. It can also be seen from the table that, for the general educational types and preparatory vocational education, the relation between the gap and the key indicators, except for unemployment of 'Preparatory vocational education, agricultural' and 'Preparatory vocational education, technical', is estimated to be negative. From the table it can also be seen that if there is a negative effect of the forecast gap on unemployment, the influence on the other key indicators is also negative. The only exception is the required branch of study for the educational type 'Intermediate vocational education, nursing and paramedical services'.

The largest negative influence with regard to the unemployment of school-leavers can be found for 'Higher general secondary education'. Relative large effects can also be seen for 'Preparatory vocational education, commerce and administration', 'Intermediate vocational education, commerce and administration', 'Higher vocational education, teacher training' and 'Lower general secondary education'. With regard to both hourly wages and monthly wages, relatively large influences of the forecast discrepancies can be found for 'Lower general secondary education', 'Higher general secondary education', 'Intermediate vocational education, commerce and administration' and 'Higher vocational education, teacher training'. Furthermore the gap has a relatively large effect on hourly wages for 'Higher vocational education, medical laboratory', whereas with regard to monthly wages this effect is large for 'Higher vocational education, social and cultural' and 'Preparatory vocational education, technical'.

It can be seen that, for preparatory vocational education in 'Agriculture' and 'Technical' the size of the labour market gap has a large influence on the percentage of school-leavers who have a job at a level below their completed educational level. 'Higher general secondary education', is also markedly influenced. At the intermediate level, the largest influence can be found for 'Non-medical laboratory'. At the higher level the largest influence is for 'Teacher training' and 'Administrative, legal and fiscal'. Discrepancies on the labour market for the educational types 'Lower general secondary education' and 'Intermediate vocational education, commerce and administration' have a relative large effect on the probability that school-leavers will get a job for which no specific education, or education in another field of study, is normally required. The same applies at the higher level for 'Teacher training', 'Commerce and administration' and 'Administrative, legal and fiscal'.

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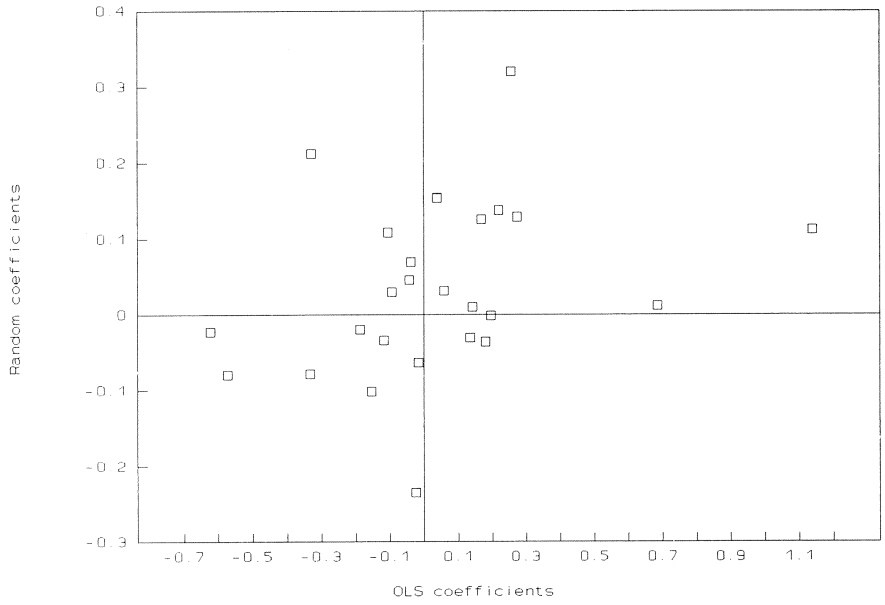
8. If the gap between labour demand and supply is determined using the fixed coefficient demand model, the results are similar to those presented here.

The percentage of school-leavers who have a temporary job as a result of the gap between labour demand and supply is large for the educational types 'Preparatory vocational education, agricultural', 'Preparatory vocational education, technical', 'Higher general secondary education', 'Intermediate vocational education, non-medical laboratory', 'Higher vocational education, engineering', 'Higher vocational education, teacher training' and 'Higher vocational education, administrative, legal and fiscal'. Finally, discrepancies on the labour market have a relatively large (negative) influence on the probability of having a part-time job for 'Lower general secondary education', 'Preparatory vocational education, technical' and 'Higher general secondary education'. At intermediate level, the largest effect can be found for 'Non-medical laboratory', 'Nursing and paramedical services' and 'Commerce and administration'. At the higher level, this also applies for 'Teacher training' and 'Social and cultural'.

Figure 4
Difference between OLS coefficients and random coefficients for unemployment

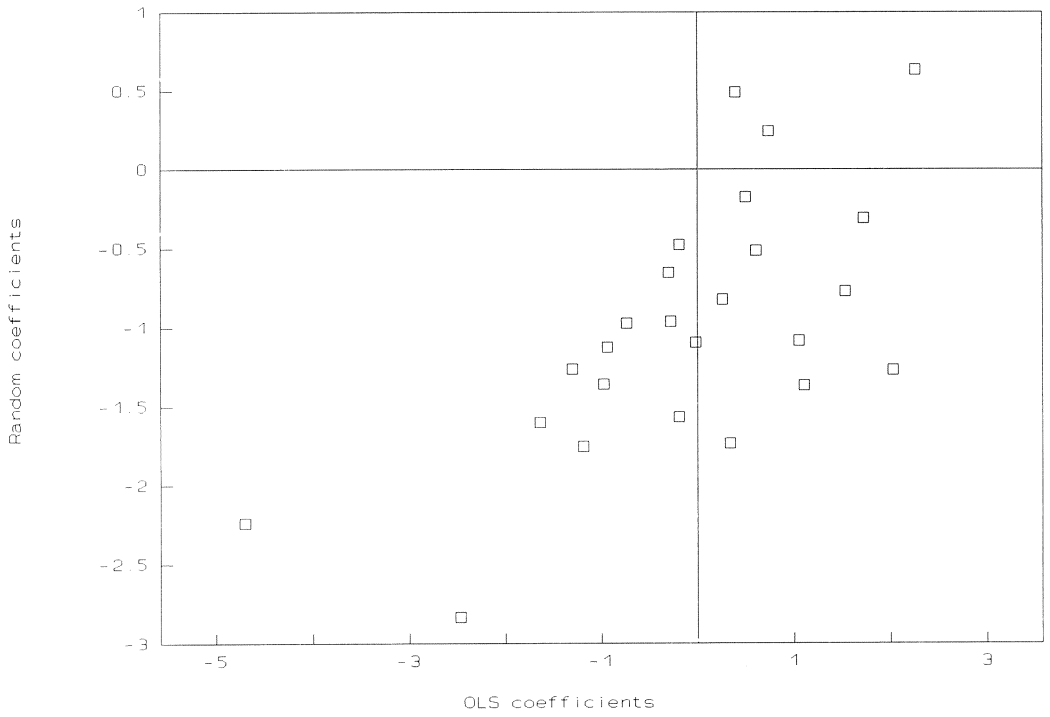


Figures 4 and 5 illustrate the difference between the results from an OLS model and from the random coefficient model, for the unemployment indicator and for monthly wages respectively. From figure 5 it can be seen that some of the positive parameters that result from the OLS estimates change into negative parameters as a result of determining the weighted average of the OLS estimates and $\bar{\beta}$. Furthermore, large positive parameter values will in general have a smaller value in the random coefficient model.

Figure 5 shows that using the random coefficient model for monthly wages brings the

parameter estimates, which include a large standard error, close to the estimated average parameter, which is, because of the pooling of data, a much less uncertain estimate, but which includes an error because of the difference between the individual types of education and the overall average.

Figure 5
Difference between OLS coefficients and random coefficients for monthly wages



9 Forecasting the labour market adjustments

The results in the previous section show how the labour market adjusts to discrepancies between demand and supply. These adjustment processes have been investigated at both the level of types of education and the average level. The parameter estimates, of course, can also be used to describe the adjustment processes which are to be expected, based on forecasts of future demand and supply. Future adjustment processes are presented in this section.

Table 11
The forecast gap between labour demand and supply for 1998

Educational type	gap 1998 %
Lower general secondary	3
Preparatory vocational	
Agricultural	10
Technical	-2
Commerce and administration	-6
Community care, hotel and catering	6
Higher general secondary	-30
Intermediate vocational	
Agricultural	0
Non-medical laboratory	5
Engineering	-6
Medical laboratory	22
Nursing and paramedical services	-1
Commerce and administration	-4
Social and cultural	-32
Community care	3
Hotel, catering and hairdressers	-11
Higher vocational	
Teacher training	4
Non-medical laboratory	7
Engineering	6
Medical laboratory	18
Nursing and paramedic	0
Commerce and administration	1
Business administration technology	-33
Administrative, legal and fiscal	2
Social and cultural	-2
Fine Arts	-6

First, in table 11, the forecasts of the gap between demand and supply for the

Netherlands in the period 1993-1998 are presented (see ROA 1993a; 1993b).[9] Then the results of the predicted adjustment processes are shown in tables 12 and 13.

The discrepancies between demand and supply for the period 1993-1998 show that, in preparatory vocational education, excess demand is forecast for 'Agricultural' and 'Community care, hotel and catering', school-leavers, whereas 'Technical' and 'Commerce and Administration' are characterized by a surplus supply. For 'Higher general secondary education' a large excess surplus is also forecast. At the intermediate level, a large surplus demand is forecast for 'Medical laboratory'. The period 1993-1998 is also characterized by large surpluses of supply for 'Intermediate vocational education, social and culture' and 'Intermediate vocational education, hotel, catering and hairdressers'. Corresponding to the large excess demand for 'Medical laboratory' at intermediate level, a surplus demand is forecast for 'Higher vocational education, medical laboratory'. At the higher level, a supply surplus is forecast for 'Business administration technology'.

In interpreting the results of the adjustment processes presented below, one should bear in mind that there are some problems in relating forecast discrepancies between labour demand and supply to the selected key indicators of the labour market position of school-leavers. Firstly, although at an average level the estimated adjustment processes are rather robust, the estimates for each type of education separately contain possibly large errors, due to the small number of observations that are available at the moment. Therefore, one should be very careful in interpreting the forecasts provided in table 12. The fact that, for some types of education, a number of parameters have been estimated to be positive (see table 10) is an indication of this shortcoming. Table 13 contains the forecasts of the expected adjustments if all parameters which are positive are set equal to zero, to avoid implausible conclusions. A similar problem arises with percentages which are predicted to be larger than 100% or below 0%. These results are of course impossible, but the model does not automatically avoid these outcomes. Bearing in mind the large degree of uncertainty, one should therefore interpret the predictions as relative indications of the expected kind of adjustment processes, rather than as predictions of their absolute size.

Secondly, the estimation results in the previous section are based on one-year gaps between demand and supply, while the forecasts refer to five-year gaps. To extrapolate these estimations correctly, information is needed about how adjustment processes accumulate. The question is whether a gap in one year increases the problems due to adjustments in the previous year, or keeps them at the same level. This refers to whether demand-supply discrepancies are to be interpreted as indications of a change in the

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9. The discrepancies in table 11 differ from those provided in ROA (1993b) because of the different definition of the gap which has been used in this paper. As mentioned earlier, lack of data about the actual number of school-leavers and the outflow made it necessary to use an alternative definition.

labour market prospects or as an indication of how favourable the labour market prospects are. In tables 12 and 13, the total five-year discrepancy has been used, assuming that there is some accumulation of adjustment problems. On the other hand, predicted discrepancies tend to be less variable than the discrepancies actually observed, which implies that the predicted adjustment might be underestimated. Therefore, once again, the results should be interpreted in relative terms rather than absolutely. In the future, as longer time series become available, the accumulation of adjustment phenomena can be investigated, providing more insight into the long-term size of adjustments.

A third problem concerning the forecasts of future adjustment processes is the use of two different sources of information, RUBS and the HBO Monitor. As was shown in section 7, the average level of different indicators, e.g. unemployment, differs strongly between the two sources. For that reason the constant terms in the model of the adjustment process have been calculated separately for each educational level. It is however impossible to say whether the high levels of unemployment for 'Higher vocational education' are due to the different moments at which the survey was held, or to a higher structural level of unemployment within this group. For the estimation results these different explanations do not matter, but for forecasting purposes it is very important to know which explanation is true. Although this is probably far from the truth, the tables are based on the assumption that unemployment is structurally higher for 'Higher vocational education'. Therefore the forecasts of unemployment for this group are much higher than for other groups. For that reason one should also, for the moment, be careful in comparing the forecast results between types of education which are in different surveys. Longer time-series will provide more information about this aspect.

Taking into account these possible shortcomings in the forecasts of future adjustment processes, the conclusion is that it is very important to increase the length of the time-series of school-leaver data used in the analysis. This will improve the quality of the forecasts and provide more insights into the dynamics of the adjustment processes on the labour market. For the time being, as stated above, forecasts of this kind at the level of individual types of education have to be treated with great care and should only be used to provide rough indications about expected changes in labour market prospects.

Tables 12 and 13 show that unemployment is expected to be somewhat higher for the educational types at a preparatory level than at the intermediate level. Unemployment for 'Higher general secondary education' and the types of education at the higher level, is relatively high. The probability of earning relatively low hourly and monthly wages is comparatively high for 'Preparatory vocational education, technical', 'Preparatory vocational education, commerce and administration' and 'Higher general secondary education'.

Table 12
Forecast of seven labour market aspects for 1998, with β unrestricted

Educational type	unem-ployment %	low hourly wages %	low monthly wages %	low job level %	outside branch %	temp. work %	part-time work %
Lower general secondary	6	27	25	25	71	54	30
Preparatory vocational							
Agricultural	7	24	18	17	69	47	25
Technical	7	31	34	29	74	57	36
Commerce and administration	7	32	36	28	73	56	37
Community care, hotel and catering	6	24	24	26	70	55	31
Higher general secondary	13	53	112	42	61	60	81
Intermediate vocational							
Agricultural	4	24	25	26	48	31	16
Non-medical laboratory	5	26	22	21	50	26	12
Engineering	2	25	23	30	49	33	12
Medical laboratory	5	13	16	17	41	28	14
Nursing and paramedical services	4	25	27	26	48	32	17
Commerce and administration	4	29	32	28	50	33	19
Social and cultural	4	35	44	35	49	38	25
Community care	4	22	22	24	48	31	14
Hotel, catering and hairdressers	4	24	35	29	47	38	24
Higher vocational							
Teacher training	9	22	16	16	14	34	7
Non-medical laboratory	10	29	22	16	19	32	10
Engineering	11	30	25	15	18	32	11
Medical laboratory	9	6	−3	9	8	32	1
Nursing and paramedic	10	26	23	19	17	37	11
Commerce and administration	10	25	23	18	16	37	11
Business administration technology	6	27	11	31	28	41	−2
Administrative, legal and fiscal	10	26	22	18	15	36	11
Social and cultural	10	28	26	20	17	38	13
Fine Arts	10	30	31	22	18	39	16

At the intermediate level this is also the case for 'Social and cultural' and also, with respect to monthly wages, for 'Hotel, catering and hairdressers'. On the other hand 'Medical laboratory' education has favourable prospects regarding income.

Table 13
Forecast for seven labour market aspects for 1998, with β restricted ($\beta \leq 0$)

Educational type	unem-ployment %	low hourly wages %	low monthly wages %	low job level %	outside branch %	temp. work %	part-time work %
Lower general secondary	6	27	25	25	71	54	30
Preparatory vocational							
Agricultural	7	24	18	17	69	47	25
Technical	7	31	34	29	74	57	36
Commerce and administration	7	32	36	28	73	56	37
Community care, hotel and catering	6	24	24	26	70	55	31
Higher general secondary	13	53	112	42	61	60	81
Intermediate vocational							
Agricultural	4	24	25	26	48	31	16
Non-medical laboratory	4	25	22	21	48	26	12
Engineering	4	25	26	30	49	33	16
Medical laboratory	4	13	16	17	41	28	14
Nursing and paramedical services	4	25	27	26	48	32	17
Commerce and administration	4	29	32	28	50	33	19
Social and cultural	4	35	44	35	49	38	25
Community care	4	22	22	24	48	31	14
Hotel, catering and hairdressers	4	25	35	29	48	38	24
Higher vocational							
Teacher training	9	22	16	16	14	34	7
Non-medical laboratory	10	26	22	16	17	32	10
Engineering	10	26	23	15	17	32	11
Medical laboratory	9	6	−3	9	8	32	1
Nursing and paramedic	10	26	23	19	17	37	11
Commerce and administration	10	25	23	18	16	37	11
Business administration technology	10	27	23	31	28	41	11
Administrative, legal and fiscal	10	26	22	18	15	36	11
Social and cultural	10	28	26	20	17	38	13
Fine Arts	10	30	31	22	18	39	16

For higher vocational education, low hourly and monthly earnings are expected for 'Fine arts'. Hourly wages are also relatively low for 'Engineering' and 'Non-medical laboratory' in the case of β unrestricted. For 'Higher vocational education, teacher training' and 'Higher

vocational education, medical laboratory' forecasts with respect to income are favourable. Graduates of 'Higher vocational education, business administration technology' have a comparatively low probability of earning relatively low monthly wages in the case of β unrestricted.

Relatively few school-leavers from 'Preparatory vocational education, agricultural' are expected to work at a relatively low level or outside the field for which they studied. At intermediate and higher level the same applies for 'Medical laboratory'. It can also be seen that a large percentage of those with 'Lower general secondary education' are working outside the branch in which they completed their studies, and many of those with 'Higher general secondary education' are expected to find work only at a lower job level. Comparatively many school-leavers from 'Intermediate vocational education, social and cultural' are expected to have a job at a level lower than the completed educational level. This also applies for 'Higher vocational education, business administration technology'. This latter type of education is also characterized by the large proportion of graduates working outside the branch in which they completed their studies. School-leavers with 'Medical laboratary' at the intermediate of higher level are more likely to work in a job that matches their level and branch of education.

The percentage of graduates from 'Preparatory vocational education, agricultural' who are forecast to have a temporary or a part-time job is relatively low, whereas these percentages are relatively high for 'Higher general secondary education'. At intermediate level the laboratory types of education have comparatively low expected percentages of temporary jobs. With regard to part-time jobs, low percentages are found for 'Non-medical laboratory' and 'Engineering'. High percentages of temporary or part-time jobs are forecast for 'Social and cultural' and 'Hotel, catering and hairdressers'. At the higher vocational level, the expected percentage of school-leavers with a temporary job is comparatively low for 'Engineering' and the laboratory types of education, whereas it is relatively high for 'Business administration technology' and 'Fine arts'. This latter educational type is also characterized by a large forecast percentage of graduates working part-time. Educational types with relatively few part-timers are 'Teacher training' and 'Medical laboratory'.

The added value of these indicators of expected labour market prospects can be illustrated by the following two examples (cf. ROA 1993b, table 25), in which the information added by this study has been printed in italics.

471 Intermediate vocational education, social and cultural

At present unemployment among school-leavers from 'Intermediate vocational education, social and cultural' is not very different from the average, but because of the very large flows from the education system, the expected labour market prospects are bad. Although those with this educational background can find employment in only a limited number of

occupations and business sectors, there are enough opportunities of switching to ensure that employment is not dependent on a single occupation. *Due to the bad prospects, however, school-leavers are expected to find jobs at lower wages and at a lower level, and which are more often temporary or part-time, rather than jobs with a regular full-time contract.*

552 Higher vocational education, medical laboratory

The current unemployment among school-leavers from 'Higher vocational education, medical laboratory' is low, as compared with other types of education within higher vocational education. *However, in the near future there will be little difference in unemployment levels between this educational type and the other types of education within 'Higher vocational education'.* The labour outflow for this education is small, but because the number undertaking the course is also low, future labour market prospects are expected to be good. *Consequently, even more school-leavers are expected to find a job at the level of higher vocational education with relatively high hourly wages, and involuntary part-time contracts will become rare. Almost all workers have a job for which this specific branch of study is required.* Those with this educational background are therefore very dependent for their employment on the occupations of medical analyst or laboratory technician and have almost no chance of switching to other occupations or business sectors.

10 Conclusions

This paper has investigated the relationship between discrepancies between demand and supply for certain types of education, which are often determined in manpower forecasts, and manifestations of adjustment processes as observed in the school-leaver surveys. The starting-point in this analysis is that the gap between demand and supply predicted in manpower forecasts should be interpreted as an indicator of the labour market tension. This tension will lead to adjustment processes which will improve the labour market situation of those who are in a shortage situation and worsen the perspectives of those who are in a surplus supply situation. This view opposes Blaug's (1967) assertion that manpower forecasting automatically implies that no adjustment processes take place on the labour market. This means that manpower forecasts which lead to predictions of the future gap between demand and supply make sense not only if surpluses lead to unemployment and shortages to unfilled vacancies, but also more generally if these discrepancies affect the labour market position of people with a certain educational background. In that case, unemployment is only one of the factors included in evaluating the labour market prospects.

A random coefficient model has been used to investigate this relationship. This model has the advantage that it recognises the fact that adjustment processes might differ between

types of education, but still makes full use of all information available in the data. The model provides estimates of average levels and separate estimates for each type of education. At the moment the estimations for the separate types of education are still subject to large possible errors because of a lack of time-series information. Average effects can be measured, however, rather accurately. In the future, better results can also be expected at the level of types of education, due to longer time-series.

On average, discrepancies between demand and supply seem not to lead directly to unemployment. Except for some types of education at a low level and some specialized types of education, discrepancies seem to have more impact on wages, the number of people working below their educational level and the number of part-time jobs. From this it can be concluded that surpluses for a type of education lead to pressure on school-leavers to accept a job below their educational level. These jobs may have lower wages. Also, school-leavers may get jobs with part-time contracts instead of the full-time contracts. This picture suggest a more indirect link between supply surpluses and unemployment. Since school-leavers in a surplus situation are forced to accept jobs below their educational level they might, by downward displacement, put school-leavers at these lower levels in an unfavourable position. These school-leavers might therefore also displace other participants on the labour market, or become unemployed. These downward displacement processes make it difficult to observe a direct relationship between discrepancies at the educational level and unemployment.

It can be concluded from this study that the labour market does indeed show a rather high degree of flexibility in adjusting to discrepancies in the demand and supply of labour of a certain educational type, although this does not necessarily refer to wage adjustments. These labour market adjustments circumvent unemployment to some extent. However, this does not imply that forecasts of the gap between demand and supply are not useful. These discrepancies lead to serious labour market problems for those involved and affect their labour market prospects. Therefore it remains useful to have some insight concerning the labour market gaps that can be expected in the future. The analysis in this paper provides an approach by which this more differentiated aspect of the matching process between demand and supply can be incorporated in an information system on education and the labour market. If more data become available, it can become an important element of the ROA forecasting system, making the forecasts of future labour market prospects more concrete than would be possible if only an abstract labour market indicator is used.

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Faculty of Economics and Business Administration

Vormgeving omslag en druk Unigraphic

ROA - RM - 1995/4E

Research Memorandum

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